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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/826,472	04/04/2001	Bin Yu	0180197	6214

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EXAMINER

POMPEY, RON EVERETT

ART UNIT PAPER NUMBER

2812

DATE MAILED: 03/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/826,472

Applicant(s)

YU, BIN

Examiner

Ron E Pompey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3 and 5-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (US 5,963,810) and further in view of Dautartas et al. (US 6,124,158), Chen (US 5,994,192), admitted prior art and Adetutu et al. (US 6,369,430).

Gardner discloses the limitations of:

For 1, 2, 5-6, 8, 9, 11, 12 and 14:

depositing a first nitride film (303, fig. 3A) on a semiconductor substrate;

depositing a high-k material (305, fig. 3B) on the first nitride (col. 5, Ins. 30-64 and col. 3, Ins. 25-32),

depositing a second nitride film on the high-k material (col. 6, Ins. 13-20);

depositing a thick gate material on the second ultra-thin nitride film; and

completing fabrication of the device;

wherein the first and second ultra-thin nitride films prevent the at least one material selected from the group consisting essentially of zirconium (Zr), hafnium (Hf) and titanium (Ti) from diffusing into the semiconductor substrate and the thick gate material respectively (col. 6, Ins. 1-12). It is inherent that the diffusion of the metal material will be prevented, because the structure of the gate dielectric (nitride/high

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k/nitride) of Gardner is the same as that of applicants claimed invention and therefore will perform the same.

3. Gardner does not disclose the claimed limitation(s) of, for claims 3, 7, 13 and 15-30:

wherein the nitride films are deposited by using an atomic layer deposition (ALD) technique.

However, Dautartas discloses the above claimed limitations in column 7, line(s) 15-30.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Dautartas with Gardner, because this deposition technique provides excellent uniformity and surface conformity of thin insulator films..

4. Gardner does not disclose the claimed limitation(s) of, for claims 10 and 18-19: that using a photoresist is part of the etching processes.

However, Chen discloses the above claimed limitations in column 4, line(s) 14-34.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Chen with Gardner, because photoresist protects the area that is not being removed during formation of the gate structure and to supply applicant with further support for the *official notice* stated in the office action mailed 8-20-02.

5. Gardner does not disclose the claimed limitation(s) of, for claim 1 and 12:

Wherein the thin metal film comprises at least one material selected form the group consisting essentially of zirconium (Zr), hafnium (Hf) and titanium(Ti).

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However, the admitted prior art discloses the above claimed limitations on page2, line(s) 1-8.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the admitted prior art with Gardner, because they are art recognized equivalent materials.

6. Gardner does not disclose the claimed limitation(s) of, for claims 2 and 12:

wherein the substrate comprises a silicon-on-insulator (SOI) wafer.

However, Adetutu discloses the above claimed limitations in column 2, line(s) 25-27.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Adetutu with Gardner, because the SOI substrate reduces the body capacitance of a semiconductor device.

Claim Objections


7. Claims 1 and 12 are objected to because of the following informalities: the language thick is not quantified in the specification and is held to make the claim indefinite. Appropriate correction is required.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ron E Pompey whose telephone number is (571) 272-1680. The examiner can normally be reached on flex schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on (571) 272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Ron Pompey
AU: 2812
February 20, 2004


John F. Niebling
Supervisory Patent Examiner
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